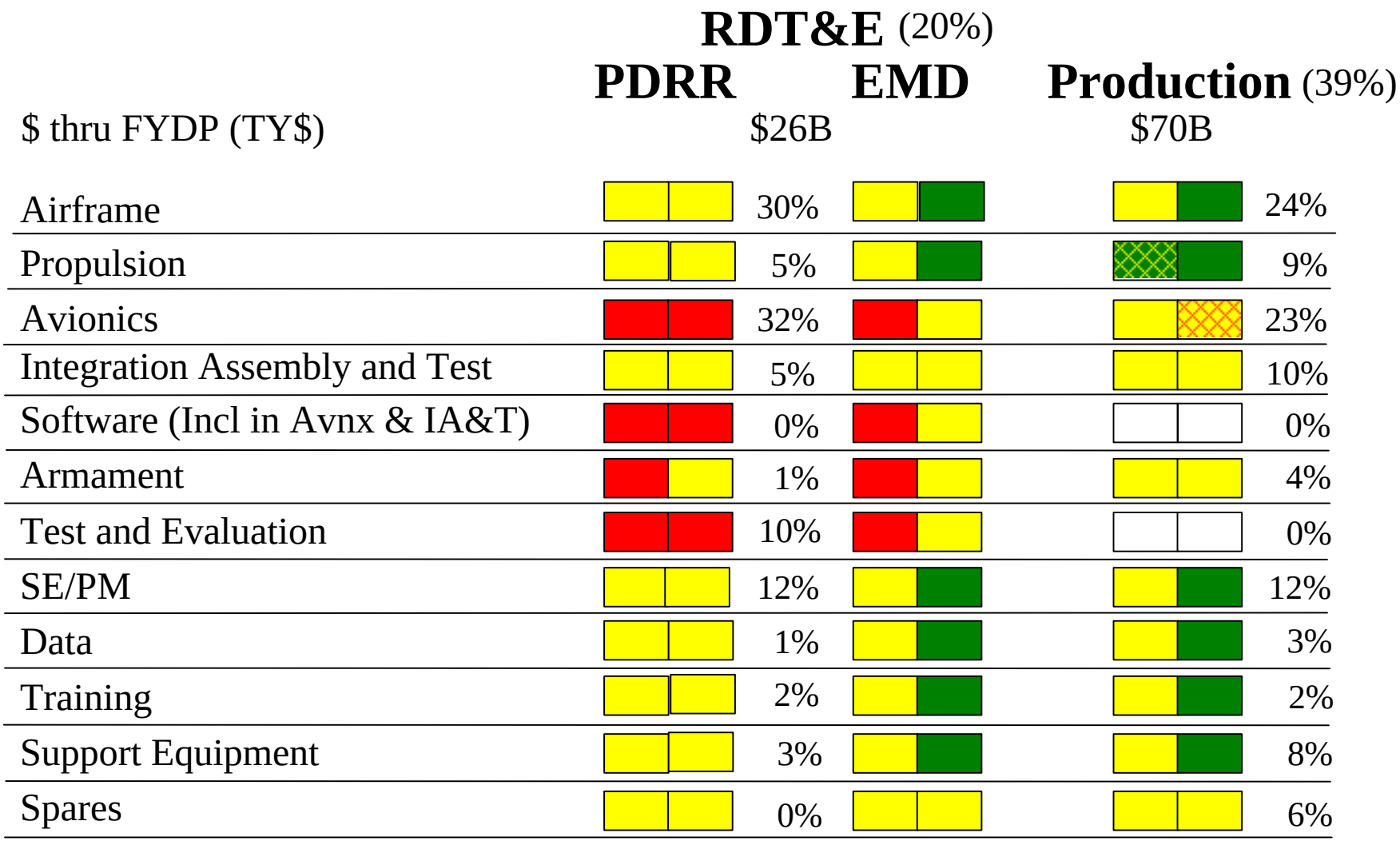
2001 DODCAS
ASSESSMENT OF OSD COST ESTIMATING CAPABILITIES

AIR FORCE PRESENTATION: LYNN C. DAVIS

AIRCRAFT – FIXED WING

SPACE SYSTEMS

Aircraft - Fixed Wing



Fixed Wing Aircraft Changes

- Avionics changed from yellow to red because there isn't too much data available on mod programs. Further, technical advances occur too quickly at times for data to be useful in studies.
- Propulsion has changed from green to yellow/green because data and studies are outdated and data on new commercial engines is scarce.

Fixed Wing Aircraft Changes

- Software estimating still remains a challenge as in other commodities. Tools to estimate software are available, however inputs are subject to analyst judgment.
  -- There is a need for a broader range of platforms and lower levels of software data.
  -- Additionally, studies of s/w estimates vs. actuals would be useful for future estimates.
  -- Further, there is a void in collecting O&S s/w costs for maintenance, debugging, updates and licensing changes.

Fixed Wing Aircraft Changes

- While Training remains yellow/green, analysts indicate a lack of available simulator data in current databases or studies.

Aircraft - Fixed Wing Cont'd

O&S (41%)

Mission Personnel	22%
Unit Level Consumption	15%
Intermediate Maintenance	8%
Depot Maintenance	13%
Contractor Support	8%
Sustaining Support	26%
Indirect Support	8%

Fixed Wing Aircraft Changes

O&S

- Depot Maintenance has gone from yellow to yellow/green indicating an improvement in data. In the Air Force, AFTOC is largely responsible for this improvement in O&S estimating

Fixed Wing Aircraft Changes

- The reason most of the colors in these charts have not changed since the last presentation is that even though we are making improvements in some areas of collecting data, we are falling behind in others. We have gained improvements from data in MACDAR providing insight into reasonable labor learning curves, but material data and curve analysis still needs significant improvement in data collection on more recent systems.

Impact of Current Studies

- General
  - An Overview of Acquisition Reform Cost Savings Estimates, SAF/AQ/RAND, 2001
- Airframe is expected to improve due to the following:
  - Military Airframe Acquisition Costs: The Effects of Advanced Materials and Manufacturing Processes, SAF/AQ/RAND, 2001
  - Military Airframe Production Costs: The Effects of Lean Manufacturing, SAF/AQ/RAND, 2001
  - Force Analysis Decision Support System (FADSS), Tecolote, 2000
  - Naval Aircraft Modifications Model (NAMM), NAVAIR/MCR, 2000
  - Cost of Stealth Study, IDA, 2001

Impact of Current Studies

- Propulsion estimating may improve due to the
  - Greatest Engine Recovery in USAF History, 56th Fighter Wing, 1999 Study
  - Aircraft Propulsion Development, Manufacturing and O&S Cost Methodologies, SAF/AQ/RAND, on-going
- Avionics support is expected to improve due to the following projects and studies
  - Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
  - The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives, SAF/AQ/RAND, 2001
  - Aircraft Avionics CER Development Phase II, Tecolote/AFCAA, 2001
  - Commercial-Off-The-Shelf Cost Modeling Effort, AFCAA, 2001
  - Avionics Support Cost Element Factors, Production, study done by ASC in 2000
  - Aircraft Avionics Database, Tecolote, 1999

Impact of Current Studies

- Integration and Assembly currently has no projects expected to enhance these estimating capabilities.
- Software estimating continues to be challenging. There are currently no on-going studies or models projected that are expected to enhance software estimating.
- Armament is expected to improve due to
  - AFCAA FY00 Missile Database, Tecolote/AFCAA, 2001
  - Missiles and Munitions CER Development (Production), Tecolote/AFCAA, 2001
- Test and Evaluation estimating is expected to improve due to
  - Avionics Support Cost Element Factors, Prod, ASC, 2000
  - Methodologies for Estimating Aircraft and Missile Non-Air Vehicle Costs, SAF/AQ/RAND, 2001

Impact of Current Studies

- SE/PM, Data, Training, Spares and Support Equipment estimating are expected to improve due to the following projects:
  - Avionics Support Cost Element Factors, Prod, ASC, 2000
  - Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC/AFCAA, on-going

Impact of Current Studies

- O&S improvements may occur due to the following projects:
  - Maintenance and Support of Composite Airframe Structure: A Cost Estimating Approach, SAF/AQ/RAND, 2001
  - Cost Factor and Model Support, Center for Systems Management, Inc./AFCAA, 2001
  - Aging Aircraft Study, RAND, 2000
  - USAF BOS IPT Study, RAND, 2002
  - Aircraft Propulsion Development, Manufacturing and O&S Cost Methodologies, SAF/AQ/RAND, on-going
  - Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC, on-going

Contributing Organizations

- Air Force Cost Analysis Agency (AFCAA)
- Air Force Material Command/Aeronautical Systems Center (AFMC/ASC)
- Naval Air Systems Command (NAVAIR)
- Naval Center for Cost Analysis (NCCA)

FYDP Representation

Aircraft Systems

RDT&E

- ATIRCM/CMWS
- Joint Strike Fighter (JSF)
- E-2C Reproduction
- F/A-18 E/F
- CEC
- C-17A
- Airborne Laser (ABL)
- B-1B CMUP/DSUP/JDAM/COMP UP
- F-22
- JSTARS
- JPATS

Procurement

- Black Hawk (UH-60L)
- ATIRCM/CMWS
- Longbow Apache
- T-45TS
- E-2C Reproduction
- AV-8B Remanufacture
- F/A-18 E/F
- CEC
- C-17A
- C-130J
- B-1B
- CMUP/DSUP/JDAM/COMP UP
- F-22
- JSTARS
- AWACS RSIP (E-3)
- JPATS

Research Efforts Recently Completed

- *Force Analysis Decision Support System (FADSS), Tecolote/AFCAA,2000*
- *Avionics Support Cost Element Factors, Prod, ASC, 2000*
- *Naval Aircraft Modifications Model (NAMM), NAVAIR/MCR, 2000*
- Defense Contractor Overhead Rate Analysis, NAVAIR, 2000
- *Total Ownership Cost: An Analysis of Cost Drivers, NAVAIR/RAND, 2000*
- *USAF BOS IPT Study, RAND, 2002*
- Cost of Stealth, IDA, 2000
- *Aging Aircraft Study, RAND, 2000*
- *Automated Model for Integrating Cost Analysis with Operational Effectiveness Analysis: Vol 3, Cost Model for Aircraft Modifications, Technomics, Dec 1999*
- Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, Tecolote, 1997

Research Efforts Completed

- Aircraft Learning Curve Trends Over Time, NAVAIR, 1999
- Production Cross Checks for Fighter Aircraft & Helicopters, NAVAIR, 1999
- B-2 Database Normalization, 1999
- Aircraft Avionics Database, Tecolote, 1999
- *Greatest Engine Recovery in USAF History, 56th Fighter Wing, 1999*
- *Avionics Support Cost Element Factors, EMD, ASC, 1998*

Research Efforts Completed

- Maintenance Trade Decision Support System, Bionetics Corp., 1998
- NAVAIR O&S Cost Model, Brennan & Associates, Inc., 1998
- Life Cycle Cost Model Development, Brennan & Associates, Inc., 1998
- *Aircraft Gas Turbine Engine Acquisition Cost and Characteristics Database Final Report, Ketron, 1998*
- *Concept Design Center, The Aerospace Corporation, date unknown*

Research Efforts Ongoing

- Aircraft Integration Model, Technomics, 2001
- *Platform Integration Study, NAVAIR, 2001*
- *Historical Aircraft Procurement Cost Archives, NAVAIR, expected 2001*
- *Propulsion Systems Database, NAVAIR/Ketron, expected 2001*
- *Aircraft Avionics CER Development Phase II, Tecolote/AFCAA, 2001*
- *AFCAA FY00 Missile Database, Tecolote/AFCAA, 2001*
- *Missiles & Munitions CER Development (Production), Tecolote/AFCAA, 2001*

Research Efforts Ongoing

- *Cost Factor and Model Support, Center for Systems Management, Inc.,/AFCAA, 2001*
- *AFI 65-503, USAF Cost Planning Factors, Center for Systems Management, Inc., 2001*
- *Estimating the Costs of Next Generation Aircraft, IDA, 2001*
- *Maintenance and Support of Composite Airframe Structure: A Cost Estimating Approach, SAF/AQ/RAND, 2001*
- *Military Airframe Acquisition Costs: The Effects of Advanced Materials and Manufacturing Processes, SAF/AQ/RAND, 2001*

Research Efforts Ongoing

- *The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives, SAF/AQ/RAND, 2001*
- *Commercial-Off-The-Shelf Cost Modeling Effort, AFCAA, 2001*
- *An Overview of Acquisition Reform Cost Savings Estimates, SAF/AQ/RAND, 2001*
- *Military Airframe Production Costs: The Effects of Lean Manufacturing, SAF/AQ/RAND, 2001*
- *Air Force Total Ownership Cost (AFTOC), Battelle/TASC/AFCAA, on-going*
- *Aircraft Propulsion Development, Manufacturing and O&S Cost Methodologies, SAF/AQ/RAND, on-going*

Areas Most in Need of Further Research

- Avionics
- Modifications (structural and avionics)
- Software
- *Propulsion*
- *Armament*
- *Test and Evaluation*

Fixed Wing Aircraft Source List

- Included at the end of this section is an updated Aircraft Estimating Source List.
- Includes all known sources of studies, methodologies, CERS, etc. for Fixed Wing Aircraft

Aircraft Estimating Source List

General

Military Airframe Acquisition Costs: The Effects of Advanced Materials and Manufacturing Processes, SAF/AQ/RAND, 2001

An Overview of Acquisition Reform Cost Savings Estimates, SAF/AQ/RAND, 2001

Military Airframe Production Costs: The Effects of Lean Manufacturing, SAF/AQ/RAND, 2001

Historical Aircraft Procurement Cost Archives, NAVAIR, expected 2001

Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC, on-going

Force Analysis Decision Support System (FADSS), Tecolote/AFCAA,2000

Defense Contractor Overhead Rate Analysis, NAVAIR, 2000

Aircraft Learning Curve Trends Over Time, NAVAIR, 1999

Production Cross Checks for Fighter Aircraft and Helicopters, NAVAIR, 1999

Integration Assembly & Test

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001

Platform Integration Study, NAVAIR, 2001

Aircraft Integration Model, Technomics, 2001

MACDAR Fighter Aircraft Database, Tecolote, 1997

C3 Platform Integration Cost Model, MCR, 1997

PRICE H, General Electric, 1997

Aircraft Estimating Source List

Airframe

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Military Airframe Acquisition Costs: The Effects of Advanced Material and Manufacturing Processes, SAF/AQ/RAND, 2001
Military Airframe Production Costs: The Effects of Lean Manufacturing, SAF/AQ/RAND, 2001
Force Analysis Decision Support System (FADSS), Tecolote/AFCAA, 2000
Avionics Support Cost Element Factors, Prod, ASC, 2000
Advanced Fighter Aircraft Cost Model, AFCAA, 1998
MACDAR Fighter Aircraft Database, Tecolote, 1997
Composites/Exotic Materials Database, Tecolote, 1997 (N/R)

Propulsion

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Propulsion Systems Database, NAVAIR/Ketron, expected 2001
Aircraft Propulsion Development, Manufacturing and O&S Cost Methodologies, SAF/AQ/RAND (on-going)
Greatest Engine Recovery in USAF History, 56th Fighter Wing, 1999
Advanced Fighter Aircraft Cost Model, AFCAA, 1998
Aircraft Gas Turbine Engine Acquisition Cost and Characteristics Database Final Report, Ketron, 1998
MACDAR Fighter Aircraft Database, Tecolote, 1997
NAVAIR/AFCAA Engine Study, Ketron, 1997 (N/R)
GFE, NAVAIR Database, 1997

Aircraft Estimating Source List

Avionics

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives, SAF/AQ/RAND, 2001
Aircraft Avionics CER Development Phase II, Tecolote/AFCAA, 2001
Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Commercial-Off-The-Shelf Cost Modeling Effort, AFCAA, 2001

Avionics Support Cost Element Factors, Prod, ASC, 2000
Avionics Support Cost Element Factors, EMD, ASC, 1998
MACDAR Fighter Aircraft Database, Tecolote, 1997
GFE, NAVAIR Database, 1997
Price H, HL, M, General Electric, 1997
SEER H, Systems Evaluation & Estimation Resources-HW, Galorath Associates, 1997
A Data Base of Airborne Avionics, Tecolote, Jan 1995

Software

SEER SEM, Systems Evaluation and Estimation Resources-S/W Est Model, Galorath, 1998
Software Development Estimating Handbook - Phase One, NCCA, 1998
Price S, Parametric Review of Info for Costing and Evaluation Software Sizing Model, GE, 1997

Aircraft Estimating Source List

Armament

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
AFCAA FY00 Missile Database, Tecolote/AFCAA, 2001
Missiles & Munitions CER Development (Production, Tecolote/AFCAA, 2001
MACDAR Fighter Aircraft Database, Tecolote, 1997

Test & Evaluation

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Methodologies for Estimating Aircraft and Missile Non-Air Vehicle Costs, SAF/AQ/RAND, 2001
Avionics Support Cost Element Factors, Prod, ASC, 2000
MACDAR Fighter Aircraft Database, Tecolote, 1997
Avionics Support Cost Element Factors, EMD, ASC, 1998
Advanced Fighter Aircraft Cost Model, AFCAA, 1998

SE/PM

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Avionics Support Cost Element Factors, Prod, ASC, 2000
MACDAR Fighter Aircraft Database, Tecolote, 1997
Avionics Support Cost Element Factors, EMD, ASC, 1998
Advanced Fighter Aircraft Cost Model, AFCAA, 1998
Below the Line Cost Factors, AFCAA, 1998
SE/PM Database, TASC, 1997

Aircraft Estimating Source List

Data

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Advanced Fighter Aircraft Cost Model, AFCAA, 1998
Below the Line Cost Factors, AFCAA, 1998
MACDAR Fighter Aircraft Database, Tecolote, 1997

Training

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Avionics Support Cost Element Factors, Prod, ASC, 2000
Avionics Support Cost Element Factors, EMD, ASC, 1998
MACDAR Fighter Aircraft Database, Tecolote, 1997
Advanced Fighter Aircraft Cost Model, AFCAA, 1998
Below the Line Cost Factors, AFCAA, 1998

Support Equipment

Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC, on-going

Aircraft Estimating Source List

Spares

Military Aircraft Cost Data Archive and Retrieval Project (MACDAR) Fighter Aircraft Database, NAVAIR, 2001
Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC, on-going
Avionics Support Cost Element Factors, EMD, ASC, 1998
Avionics Support Cost Element Factors, Prod, ASC, 2000
MACDAR Fighter Aircraft Database, Tecolote, 1997
OP-20, Obligated Spend Profiles, NAVAIR, annual

O&S

Aircraft Support Cost and Budget Estimating Relationships, Phase I 2001, Phase II 2002, Phase III 2003, Phase IV 2004)
Maintenance and Support of Composite Airframe Structure: A Cost Estimating Approach, SAF/AQ/RAND, 2001
Cost Factor and Model Support, Center for Systems Management Inc./AFCAA, 2001
System and Force Structure Cost Modeling and CER Development, SAIC/AFCAA, 2001
Aircraft Propulsion Development, Manufacturing and O&S Cost Methodologies, SAF/AQ/RAND
Air Force Total Ownership Cost (AFTOC) Management Information System, Battelle/TASC, on-going

Aircraft Estimating Source List

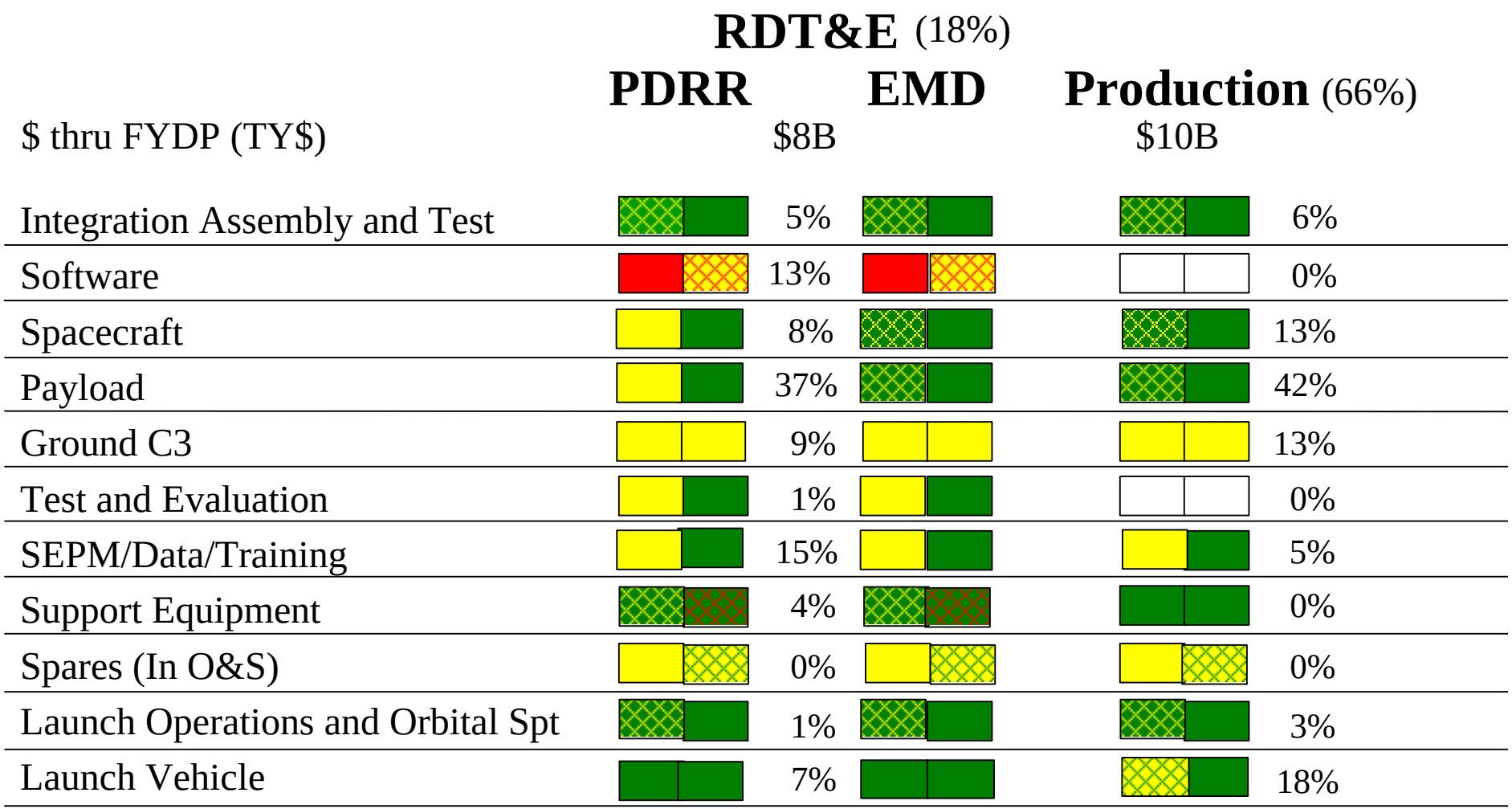
O&S Cont'd

Aging Aircraft Study, RAND, 2000
USAF BOS IPT Study, RAND, 2000
PPR Data / SDLMs (Depot Level Maintenance), NADOC, annual
OP-20, Obligated Spend Profiles, NAVAIR, annual
C3 Platform Integration Cost Model, MCR, 1997
Naval Aircraft Modification Database, MCR, 1996
F/A-18E/F Advanced Material Repair Development Program for Repair Guidance
Tri-Service LCC Model, EER Systems, Unknown

Acquisition Reform Impacts

- Overall, Acquisition reform has impacted our ability to collect cost data
- We are in dire need of support to get the right cost data for estimating future systems
- Emphasis on non-standardization has caused
  - Inconsistent reporting in WBS formats
  - Limited usefulness of data
  - By making data incomparable
- Continuing challenge to get PMs to include data collection in their contracts

Space Systems



Space Systems Changes

- Integration and Assembly, Spacecraft, Payload, Support Equipment and Launch Operations and Orbital Support were downgraded to yellow in RDT&E and Production because of Unmanned Spacecraft Cost Model's limited ability to capture new technology or get a high degree of leverage from commercial SATCOM designs
- Software is revised to red because of the seriously limited amount of data and level of detailed historical data hampers parametric models' ability (IDA, SEER-SEM) to develop estimates and cross-checks. Software remains the most troublesome area in estimating.
- Spares were revised to green because there is now some data available to develop factors for hardware estimates
- Launch Vehicle changed to green due to adequate recent historical data being available on UFO and EELV. Further, launch services are purchased, not estimated and are considered a pass through
  - If we were to need to estimate launch services, this area would immediately turn to red

Space Systems (cont.)

O&S (16%)

Mission Personnel	14%
Unit Level Consumption	12%
Intermediate Maintenance	0%
Depot Maintenance	3%
Contractor Support	2%
Sustaining Support	66%
Indirect Support	3%

Space Systems Changes Cont'd

- Our historical data is diminishing as a variable means of estimating in the space arena
  - Expansion of the commercial space industry and DOD's shifting away from state-of-the-art technology toward commercially available technology along with
  - Commercial technology not being required to report costs at lower levels of details leads to
  - Less and less data being available for collection in historical databases.
- Mission Personnel has diminished to yellow because many O&S analogies are based on
  - A wide variety of communications-related functions
  - Costs cannot be clearly allocated among them

Space Systems Changes Cont'd

- Unit Level Consumption has improved to yellow-green because AFTOC added some space systems, increasing insight into these costs
- Depot Maintenance, Contractor Support, Sustaining Support and Indirect Support have diminished to red because
  - Scant historical data is available
  - Requires significant assumptions related to cost allocation

Changes Due to Current Studies

- Integration Test and Assembly is expected to be enhanced by the continued work by NASA/AF Cost Model (NAFCOM)
- However, Software is still our biggest challenge
  - There are currently no studies or models expected in 2001 which would improve our capability
- Spacecraft, Payload, Support Equipment and Launch and Operations and Orbital Support
  - Currently have no studies or models expected in 2001 which would greatly improve our capability to estimate these WBS elements

Contributing Organizations

- Air Force Cost Analysis Agency (AFCAA)
- Air Force Space and Missile Systems Center (AF/SMC)
- Space and Naval Warfare Systems Command (SPAWAR)

FYDP Representation

Space Systems

RDT&E

Global Broadcast Service (GBS)
National Polar-Orbiting Operational Environmental Satellite System (NPOESS)
Navy Extremely High Frequency SATCOM (NESP)
NAVSTAR Global Positioning System (GPS)
Evolved Expendable Launch Vehicle (EELV)
Defense Meteorological Satellite Program (DMSP)
Space Based Infrared Systems (SBIRS)
Titan IV
Milstar

Procurement

GBS
NESP
NAVSTAR GPS
DMSP
SBIRS
Titan IV

Note: Not included in the FYDP calculation are Defense Satellite Communications Systems III (DSCS III) and Advanced Extremely High Frequency (EHF) programs, due to no SAR reporting as yet.

Research Efforts

Recently completed:

- Communications Payload and Spaceborne Electronics Cost Model, MCR, 1998
- Small Satellite Subsystems Cost Model, Aerospace, 1998
- *Space-Based Optical Instrument Cost Model, The Aerospace Corporation, date unknown*
- *Cost of Space, Launch and Ground Systems, The Aerospace Corporation, date unknown*

Ongoing:

- Passive Sensor Cost Model (PSCM) Data Collection Phase IX, Tecolote, 2001
- Unmanned Space Vehicle Cost Model 8th edition, Tecolote, 2001
- NASA/Air Force Cost Model (NAFCOM), AFCAA/NASA

Areas Most in Need of Further Research

- Software
- *Support Equipment*
- *O&S*
- *Depot Maintenance*
- *Contractor Support*
- *Indirect Support*
- *Sustaining Support*

Other specific areas needing research are:

- *Building Composite Material Learning Curves*
- *Creating methodology for handling non-recurring satellite costs*
- *Collecting cost, technical and schedule data for the Satellite Manager's Handbook*
- *Collecting data on payload, bus and sensor levels*

Space Estimating Source List

- Included at the end of this section is an updated “Space Estimating Source List”, which includes all known sources of studies, methodologies, CERs, etc. for Space Systems.

Space Estimating Source List

General

Small Satellite Subsystems Cost Model, Aerospace, 1998
NASA/AF Cost Model (NAFCOM), SAIC, 1997

Integration Assembly & Test

Small Satellite Subsystem Cost Model, Aerospace, 1998
NASA/AF Cost Model (NAFCOM), SAIC, 1997
SEER H, Systems Evaluation and Estimation Resources-Hardware, Galorath Associates, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996

Software

COCOMO II (USC), AFCAA, 2000
SEER SEM, Systems Evaluation and Estimation Resources-Software, Galorath, 1998
PRICE S, Martin Marietta, 1997
SMC Software Sizing Database, SMC, 1997
Sage, Software Engineering, Inc. (SEI), 1995

Spacecraft

Small Satellite Subsystem Cost Model, Aerospace, 1998
NASA/AF Cost Model (NAFCOM), SAIC, 1997
PRICE H, General Electric, 1997
SEER H, Systems Evaluation & Estimation Resources-HW, Galorath Associates, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996
Phase I Acquisition Reform, TASC, 1996
TRANSCOST, TransCost Systems, 1995
JPL Project Cost Model, Jet Propulsion Lab
NAVSTAR GPS Data, SMC/FMC, date unknown

Space Estimating Source List (cont.)

Payload

Passive Sensor Cost Model (PSCM) Data Collection Phase IX, Tecolote, 2001
Commercial-Off-The-Shelf Cost Modeling Effort, AFCAA, 2001
Communications Payload and Spaceborn Electronics Cost Model, MCR, 1997
Price H/M, Martin Marietta, 1997
SEER H, Galorath, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996

Ground C3

Commercial-Off-The-Shelf Cost Modeling Effort, AFCAA, 2001
Ground Operations Cost Model-GOCM, SAIC, 1996
TRANSCOST, TransCost Systems, 1995

Test and Evaluation

NASA/AF Cost Model (NAFCOM), SAIC, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996

SE/PM

Small Satellite Subsystem Cost Model, Aerospace, 1998
NASA/AF Cost Model (NAFCOM), SAIC, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996

Space Estimating Source List (cont.)

Support Equipment

Unmanned Spacecraft Cost Model (USCM), Tecolote 1997
NASA/AF Cost Model (NAFCOM), SAIC, 1997
Price H, Martin Marietta, 1997
Seer H, Systems Evaluation & Estimation Resources-H/W, Galorath, 1997
Spacecraft Functional CERs, IDA for BMDO, 1996

Data

Passive Sensor Cost Model (PSCM) Data Collection Phase IX, Tecolote, 2001
Unmanned Space Vehicle Cost Model 8th edition, Tecolote, 2001
NASA/AF Cost Model (NAFCOM), SAIC, 1997

Training

NASA/AF Cost Model (NAFCOM), SAIC, 1997
NAVSTAR GPS Data, SMC/FMC, date unknown

Spares

GPALs CERs, TASC-Arlington, Jan 1993

Launch Operations & Orbital Support

Small Satellite Subsystem Cost Model, Aerospace, 1998
Spacecraft Functional CERs, IDA for BMDO, 1996
TRANSCOST, TransCost Systems, 1995

Space Estimating Source List (cont.)

Launch Vehicle

NASA/AF Cost Model (NAFCOM), SAIC, 1997
Launch Vehicle Cost Model, Tecolote, 1996
Liquid Rocket Engine Cost Model, Rockwell, 1996
TRANSCOST, TransCost Systems, 1995

Acquisition Reform Impacts

- Impacting estimating ability
  - Reform initiatives have cut down on amount of cost data available to collect
  - No concrete evidence that cost reduction initiatives have actually created any savings
  - Savings unquantifiable
- Impact is historical data is diminishing as a variable means for estimating in the space arena